101 MA06

07239

ROLL No. | | | | | | QN. BOOKLET No.

TEST FOR FIRST DEGREE PROGRAMMES IN ENGINEERING AND TECHNOLOGY

MATHEMATICS

Time: 1½ Hours Maximum Marks: 375

INSTRUCTIONS TO CANDIDATES

1. You are provided with a Question Booklet and an Optical Mark Reader (OMR) Answer Sheet to mark your responses. Do not soil your OMR Sheet. Read carefully all the instructions given on the OMR Sheet.

2. Write your Roll Number in the space provided for on the top of this page.

3. Also write your Roll Number, Examination Centre, Subject name and the date and time of the examination in the columns provided for the same on the Answer Sheet and write your Roll Number and Centre Code in the boxes provided for the same.

4. The paper consists of 125 objective type questions. All questions carry equal marks.

5. Each question has four alternative responses marked **A, B, C** and **D** and you have to **darken** the bubble fully corresponding to the correct response as indicated in the example shown on the Answer Sheet. Use **HB Pencil** to mark your choices on the Answer Sheet

6. Each correct answer carries **3** marks and each wrong answer carries **1** minus mark.

7. Please do your rough work only on the space provided for it at the end of this question booklet.

8. You should return the Question Booklet and the Answer Sheet to the Invigilator before you leave the examination hall.

9. Every precaution has been taken to avoid errors in the Question Booklet. In the event of such unforeseen happenings, suitable remedial measures will be taken at the time of evaluation.

10. Please feel comfortable and relaxed. You can do better in this test in tension-free disposition.

WISH YOU A SUCCESSFUL PERFORMANCE

1. If α, β and γ are such that $\alpha+\beta+\gamma=0$, then $\begin{vmatrix} 1 & \cos\gamma & \cos\beta \\ \cos\gamma & 1 & \cos\alpha \\ \cos\beta & \cos\alpha & 1 \end{vmatrix}$ is equal to -

(A) 0. (B) 1.
(C) 2. (D) $\cos^2\alpha+\cos^2\beta+\cos^2\gamma$.

2. Period of $f(x)=\tan(3x+2)$ is -

(A) π. (B) $2\pi/3$.
(C) $\pi/3$. (D) $3\pi/2$.

3. The function $f(x)=1+|\sin x|$ is -
(A) continuous everywhere.
(B) differentiable no where.
(C) differentiable at an infinite number of points.
(D) differentiable at $x=0$.

4. Let a function $f(x)$ be defined by $f(x)=\dfrac{x-|x-1|}{x}$, then $f(x)$ is -

(A) continuous at $x=0$. (B) discontinuous at $x=1$.
(C) not differentiable at $x=0$. (D) differentiable at $x=1$.

5. If the curves $y^2=16x$ and $9x^2+by^2=6$ cut each other at right angles, then the value of b is -

(A) 2. (B) 4.
(C) 9/2. (D) 1.

6. The radius of a balloon is increasing at the rate of 10 *cm/sec*. When its radius is 15 *cm*, the surface area of the balloon increases at the rate of

(A) 1000 π *sq.cm*/sec. (B) 1200π *sq.cm*/sec.
(C) 1350π *sq.cm*/sec. (D) 1500π *sq.cm*/sec.

7. The path of a particle moving in a straight line is given by $s=t^3-6t^2+9t+4$. Then s is increasing when -

(A) $t>1$ or $t>3$. (B) $t<2$.
(C) $1<t<3$. (D) $3<t<6$.

8. The maxima and minima value of the function $y = x + \sin 2x$ in $0 \le x \le 2\pi$ is -

(A) max $= \pi$, min $= \pi/3$. (B) max $= \pi$, min $= 0$.
(C) max $= 2\pi$, min $= 0$. (D) max $= \pi$, min $= \pi/2$.

9. x^x has a stationary point at -

(A) $x = e$. (B) $x = 1/e$.
(C) $x = 1$. (D) $x = \sqrt{e}$.

10. If an observation in a series is zero, then its G.M. will be -
(A) indeterminate. (B) positive.
(C) zero. (D) finite.

11. The G.M. of the series 1, 2, 4, 8, 16, ... 2^n is -

(A) $2^{(n+1)/2}$. (B) 2^{n+1}.
(C) $2^{n/2}$. (D) $2n$.

12. The coefficient of correlation is independent of -

(A) origin but not scale. (B) scale but not origin.
(C) neither origin nor scale. (D) both origin and scale.

13. The angle between planes $2x - y + z = 6$ and $x + y + 2z = 7$ is -

(A) 30°. (B) 60°.
(C) 45°. (D) 90°.

14. The matrix $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 1 & m & -1 \end{bmatrix}$ is -

(A) idempotent. (B) nilpotent.
(C) equal to its inverse. (D) symmetric.

15. The length of the perpendicular from the point A (1, 2, 3) on the line $\frac{x-6}{3} = \frac{y-7}{1} = \frac{z-6}{-2}$ is -

(A) $\sqrt{34}$. (B) $\sqrt{33}$.
(C) $\sqrt{23}$. (D) $\sqrt{32}$.

16. If $R(t)=\begin{bmatrix}\cos t & \sin t\\ -\sin t & \cos t\end{bmatrix}$, then $R(s)R(t)$ equals -

(A) $R(s+t)$. (B) $R(s-t)$.
(C) $R(s)+R(t)$. (D) $R(s)-R(t)$.

17. The angle made by the line $x+\sqrt{3}y-6=0$ with the positive direction of x-axis is -

(A) 30°. (B) 150°.
(C) 60°. (D) 110°.

18. The value of k if the straight line $2x+3y+4+k(6x-y+12)=0$ is perpendicular to the line $7x+5y=4$ is -

(A) $-29/37$. (B) $37/29$.
(C) $29/37$. (D) $-37/29$.

19. Number of points on the line $x+y=4$ that lie at a unit distance from the line $4x+3y=10$ is -

(A) 0. (B) 1.
(C) 3. (D) 2.

20. The line $(\lambda+2\mu)x+(\lambda+3\mu)y=\lambda-\mu$ for different values of λ and μ passes through the point -

(A) (3/5, 2/5). (B) (2/5, 2/5).
(C) (3/5, 3/5). (D) (2/5, 3/5).

21. The lines $x-2y-6=0$, $3x+y-4=0$ and $\lambda x+4y+\lambda^2=0$ are concurrent if -

(A) $\lambda\neq 2$. (B) $\lambda=-3$.
(C) $\lambda=4$. (D) $\lambda=-4$.

22. Equation of one of the diameters of the circle $x^2+y^2-12x+4y+6=0$ is given by -

(A) $x+y=0$. (B) $x+3y=0$.
(C) $x=y$. (D) $3x+2y=0$.

23. If the two circles $(x-1)^2+(y-3)^2=r^2$ and $x^2+y^2-8x+2y+8=0$ intersect in two distinct points, then -

(A) $2<r<8$. (B) $r=2$.
(C) $r<2$. (D) $r>2$.

24. The liens $3x-4y+4=0$ and $6x-8y-7=0$ are tangents to the same circle, then its radius is -

(A) 1/4. (B) 1/2.
(C) 3/4. (D) 1/3.

25. The circle $x^2+y^2-6x-10y+p=0$ does not touch or intersect the axes and the point (1, 4) is inside the circle, then -

(A) $0<p<29$. (B) $25<p<35$.
(C) $25<p<29$. (D) $p>35$.

26. The distance between the parallel lines $9x^2-6xy+y^2+18x-6y+8=0$ is -

(A) $1/\sqrt{10}$. (B) $2/\sqrt{10}$.
(C) $4/\sqrt{10}$. (D) $\sqrt{10}$.

27. If (a,b) is the mid point of a chord passing through the vertex of the parabola $y^2=4x$, then -

(A) $a=2b$. (B) $2a=b^2$.
(C) $a^2=2b$. (D) $2a=b$.

28. The sum of any real positive quantity and its reciprocal is never less than -

(A) 1. (B) 2.
(C) 3. (D) 4.

29. The integral solution of $(5x-1)<(x+1)^2<(7x-3)$ is -

(A) 2. (B) 4.
(C) 3. (D) 5.

30. In the binomial expansion of $(a+b)^n$ the coefficients of the 4^{th} and 13^{th} term are equal to each other. The value of n is -

(A) 10. (B) 15.
(C) 20. (D) 25.

31. If $(x+1)^n=C_0+C_1x+C_2x^2+....+C_nx^n$, then the value of $C_0+2C_1+3C_2+....+(n+1)C_n$ will be-

(A) $(n+2)2^n$. (B) $(n+1)2^n$.
(C) $(n+1)2^{n-1}$. (D) $(n+2)2^{n-1}$.

32. The points representing the complex number z for which $\arg\left(\frac{z-2}{z+2}\right)=\frac{\pi}{3}$ lie on -

(A) a circle. (B) a straight line.
(C) an ellipse. (D) a parabola.

33. The number of solutions of the equation $z^2+\bar{z}=0$ is -

(A) 1. (B) 2.
(C) 3. (D) 4.

34. If $\left(\frac{1-i}{1+i}\right)^{100}=a+ib$, then -

(A) $a=2,\ b=-1.$ (B) $a=1,\ b=0.$
(C) $a=0,\ b=1.$ (D) $a=-1,\ b=2.$

35. The solution of the equation $81^{\sin^2 x}+81^{\cos^2 x}=30$ in the interval $0\le x\le \pi/2$ is -

(A) $\pi/3.$ (B) $\pi/2.$
(C) $\pi/6.$ (D) $\pi/4.$

36. If $\cos\alpha, \sin\alpha$ be the roots of the equation $ax^2+bx+c=0$, then -

(A) $a^2-b^2+2ac=0.$ (B) $(a+b)^2=b^2+c^2.$
(C) $a^2+b^2-2ac=0.$ (D) $(a-c)^2=b^2+c^2.$

37. For values of λ, do both the roots of $x^2-4\lambda x+(4\lambda^2-3\lambda+2)=0$ exceed 2 is -

(A) $\lambda > 1.$ (B) $\lambda > 2.$
(C) $\lambda < ¾.$ (D) $\lambda = 0.$

38. The number of diagonals that can be drawn in a plane figure of 16 sides is -

(A) 54. (B) 104.
(C) 116. (D) 120.

39. The radius of the circle $\left|\frac{z-i}{z+i}\right|=3$ is -

(A) $\frac{5}{4}.$ (B) $\frac{3}{4}.$

(C) $\frac{1}{4}.$ (D) $\frac{1}{2}.$

40. If $(\sqrt{3}+i)^{100} = 2^{99}(a+ib)$, then a^2+b^2 is equal to -

(A) 1. (B) 2.
(C) 3. (D) 4.

41. The minimum value of $\sec 5x + 5\cos x (-\pi/2 < x < \pi/2)$ is -

(A) 1. (B) 3.
(C) 4. (D) 6.

42. The value of $\int_0^a \frac{x^4 dx}{\sqrt{a^2-x^2}}$ is -

(A) $(\pi a^4/16)$. (B) $(3\pi a^4/16)$.
(C) $(3\pi a^2/16)$. (D) 0

43. The real number whose decimal expansion is 0.999....(9 recurring infinitely) is -

(A) a positive integer. (B) a negative integer.
(C) a non-integer rational number. (D) irrational.

44. The value of $\sum_{k=1}^{8} \frac{1}{(k+1)\sqrt{k}+k\sqrt{k+1}}$ is -

(A) 1. (B) 1/3.
(C) 2/3. (D) 4/3.

45. The value of $\prod_{n=2}^{10}\left(1-\frac{1}{n^2}\right)$ (Π denotes the product) is -

(A) 11/19. (B) 11/20.
(C) 11/21. (D) 10/21.

46. If $x = \cos t - i\sin t$, then the value of $x^n + x^{-n}$ (n is a +ve integer) is equal to -

(A) 2 cos t. (B) n cos nt.
(C) 2 cos nt. (D) 2 cos $2t$.

47. If m is a positive integer then a possible value of $n \neq 0$ so that $mn + 1$ is a perfect cube is -

(A) m^2+3. (B) m^2+3m.
(C) m^2+m. (D) m^2+3m+3.

48. For any $x \in (0, \pi/4)$ the value of $1 - \frac{2\tan x}{\tan 2x}$ is -

(A) 1. (B) $\tan x$.
(C) $\tan^2 x$. (D) 0.

49. The minimum value of $|x-3|+|x+1|$ as x varies over the reals is -

(A) 1. (B) 2.
(C) 3. (D) 4.

50. If a and b are the roots of $x^2+x+1=0$, then the value of $\frac{1}{1-a}+\frac{1}{1-b}$ equals -

(A) 0. (B) 1.
(C) 1/2. (D) 2.

51. If $x = \sqrt{2+\sqrt{2+\sqrt{2+.....}}}$ upto ∞ where the square roots are positive, then the value of x is -

(A) 2. (B) 1.
(C) 1/2. (D) 0.

52. If $a = \cos(2\pi/7) + i\sin(2\pi/7)$ and $\alpha = a + a^2 + a^4$, $\beta = a^3 + a^5$, then α and β are the roots of the equation -

(A) $x^2+2=0$. (B) $x^2+x+2=0$.
(C) $x^2+x+4=0$. (D) $2x^2+3x+1=0$.

53. If one root of the equation $2x^2+(i+2)x+(1-i)=0$ is $(i-1)$, then the other root is -

(A) $-i$. (B) i.
(C) $i+1$. (D) $-1-i$.

54. The excluded real values of x for which $\frac{1}{1+x}, \frac{1}{1-x^2}, \frac{1}{1-x}$ are in A.P. are -

(A) $x<0$. (B) $x>0$.
(C) $x=0$. (D) $x=\pm 1$.

55. If $(b+c)$, $(c+a)$, $(a+b)$ are in H.P., then $\frac{a}{b+c}, \frac{b}{c+a}, \frac{c}{a+b}$ are in -

(A) A.P. (B) G.P.
(C) H.P. (D) None of the above.

56. The quadratic equation in x such that the arithmetic mean of its roots is 3 and their geometric mean is 2 is -

(A) $x^2+4=0$. (B) $x^2-6x+1=0$.

(C) $x^2+6x+4=0$. (D) $x^2-6x+4=0$.

57. The sum to n-terms of the series $\frac{3}{1^2.2^2}+\frac{5}{2^2.3^2}+\frac{7}{3^2.4^2}+....$ is -

(A) $\frac{(2n+1)^2}{(n+1)^2}$. (B) $\frac{n^2+2n}{n+1}$.

(C) $\frac{n^2+2n}{(n+1)^2}$. (D) $\frac{n^2-2n}{(n-1)^2}$.

58. Suppose a, b, c are in A.P. and $|a|<1$, $|b|<1$, $|c|<1$.
Let $x=1+a+a^2+.....\text{to}\ \infty$, $y=1+b+b^2+.....\text{to}\ \infty$,
$z=1+c+c^2+.....\text{to}\ \infty$. Then x, y, z are in -

(A) A.P. (B) G.P.

(C) H.P. (D) None of the above.

59. If n and r are positive integers and ${}^{3n}C_r = {}^{3n}C_{n+r}$, then -

(A) $r=2n$. (B) $r=n$.

(C) $r=n+1$. (D) $r=0$.

60. If $a+b+c=0$ and $\Delta=\begin{vmatrix} a-x & c & b \\ c & b-x & a \\ b & a & c-x \end{vmatrix}=0$, with $x\neq 0$, then -

(A) $x=a^2+b^2+c^2-abc$.

(B) $x^2=a^2+b^2+c^2-bc-ca-ab$.

(C) $x^2=a^2+b^2+c^2-3abc$.

(D) $x=a^2+b^2+c^2-bc-ca-ab$.

61. If $x=\frac{1}{\log_2 \pi}+\frac{1}{\log_3 \pi}$, then -

(A) $x<0$. (B) $0<x<2$.

(C) $x=2$. (D) $x>2$.

62. In a row, m persons are sitting. Two of them are selected at random. The probability that the two selected persons are not together is -

(A) $\frac{2}{m}$. (B) $\frac{m}{2}$.

(C) $\frac{2}{m}-1$. (D) $1-\frac{2}{m}$.

63. The value of $\cos y\cos\left(\frac{\pi}{2}-x\right)-\cos\left(\frac{\pi}{2}-y\right)\cos x+\sin y\cos\left(\frac{\pi}{2}-x\right)+\cos x\sin\left(\frac{\pi}{2}-y\right)$ is 0 if -

(A) $x=0$. (B) $y=0$.
(C) $x=y$. (D) $x-y=3\pi/4$.

64. The value of $\cot 1^\circ \cot 2^\circ....\cot 89^\circ$ equals -

(A) 1. (B) $\tan 40^\circ$.
(C) $\cot 40^\circ$. (D) 0.

65. If A and B are acute angles such that $\tan(A+B)$ and $\tan(A-B)$ both satisfy the equation $x^2-4x+1=0$, then the values of A and B are -

(A) $\pi/4$ and $\pi/2$. (B) $\pi/3$ and $\pi/4$.
(C) $\pi/2$ and $\pi/3$. (D) $\pi/4$ and $\pi/6$.

66. If the angles of a triangle are in the ratio 2 : 3 : 7, then the sides opposite to these angles are in the ratio -

(A) $1:\sqrt{2}:\frac{\sqrt{3}+1}{\sqrt{2}}$. (B) $2:\sqrt{2}:\sqrt{3}+1$.

(C) $\sqrt{2}:1:\sqrt{3}+1$. (D) $1:\sqrt{3}+1:\sqrt{2}$.

67. If $x\le 1$, then the value of $\pi/4-\tan^{-1}\left(\frac{1+x}{1-x}\right)$ is -

(A) 0. (B) $\tan^{-1}x$.
(C) $\pi/4$. (D) $-\tan^{-1}x$.

68. The points $A=(2a,\ 4a)$, $B=(2a,\ 6a)$ and $C=(2a+\sqrt{3}a,\ 5a)$ $(a>0)$ form -

(A) an equilateral triangle.
(B) an isosceles, non-equilateral triangle.
(C) a right angled triangle.
(D) a triangle with angles all acute but not equal to 60°.

69. The point of intersection of the lines $\frac{x}{a}+\frac{y}{b}=1$ and $\frac{x}{b}+\frac{y}{a}=1$ $(a \neq b)$ lies on -

(A) $x+y=0$. (B) $x-y=0$.
(C) $ax+by=1$. (D) $bx+ay=1$.

70. The equation of a line through $(-2,11)$ touching the circle $x^2+y^2=25$ is -
(A) $3x+4y=38$. (B) $4x+3y=25$.
(C) $11x+2y=9$. (D) $-2x+11y=25$.

71. The locus of points (x, y) satisfying $x^2+y^2+2gx+2fy+c=0$ (g, f, c are real) is empty if -

(A) $g^2+f^2=c^2$. (B) $g^2+f^2<c$.
(C) $g^2+f^2>c$. (D) $g^2+f^2=c$.

72. For the function $f(x)=x|x|$ (x a real number) -

(A) $f'(0)$ does not exist. (B) $f'(0)=0$.
(C) $f'(0)=1$. (D) $f'(0)=-1$.

73. If z and w are complex numbers with $|z| = 2$ and $|w| = 4$, then $|z-w|$ is greater than or equal to -
(A) 4. (B) 3.
(C) 2. (D) 6.

74. If $x=\tan(\theta/2)$ and $y=(1+\cos\theta)/\sin\theta$, then -

(A) $x+y=1$. (B) $xy=1$.
(C) $x^2+y^2=1$. (D) $x^2-y^2=1$.

75. The area of the triangle in the plane whose vertices are the complex numbers z, iz, $z+iz$ $(z \neq 0)$ is -

(A) $\frac{|z|^2}{2}$. (B) $|z|^2$.

(C) $\frac{2|z|^2}{3}$. (D) $\frac{3|z|^2}{2}$.

76. The number of terms in the binomial expansion of $(a+b)^{n+1}$ where n is any positive integer is -

(A) n. (B) $n+1$.
(C) $n+2$. (D) $n+3$.

77. The graph of $y = -|x| (x \in \mathbb{R}, x \neq 0)$ lies in -

(A) first and second quadrants.
(B) second and third quadrants.
(C) third and fourth quadrants.
(D) fourth and first quadrants.

78. If $f(x) = \int_0^x t^4 dt \ (x > 0)$, then $f(x)$ in $(0, \infty)$ is -

(A) increasing.
(B) decreasing.
(C) increasing in (0, 1) and decreasing in [1, ∞)
(D) decreasing in (0, 1) and increasing in [1, ∞).

79. $\lim_{x \to \infty} \frac{\sin x}{x}$ -

(A) does not exist.
(B) is 0.
(C) is 1.
(D) is ∞.

80. For x real -

(A) $-|x| \leq x$.
(B) $|x| \leq x$.
(C) $|x| \leq -x$.
(D) $|x| = x$.

81. The locus of a point P which moves in the plane in such a way that the sum of its distances from two fixed points A and B is equal to the length of AB is -

(A) a line segment.
(B) a circle.
(C) an ellipse.
(D) a parabola.

82. The number of real solutions of $y^{2n} = x$ where n is a positive integer and $x > 0$ is -

(A) 1.
(B) 2.
(C) 3.
(D) ∞.

83. If $y = \log_a x$ with $a > 0$ and $x \in (0, \infty)$, then $\frac{dy}{dx}$ is -

(A) $1/x$.
(B) $1/a$.
(C) 0.
(D) $1/x \log a$.

84. The n^{th} derivative of $a_0 + a_1 x + a_2 x^2 + ... + a_m x^m$ where $m < n$ is -

(A) $m!$.
(B) $n!$.
(C) $n! a_n$.
(D) 0.

85. The value of $\tan^{-1}\frac{2x}{1-x^2}$ for $0 < x < 1$ is -

(A) x. (B) $2x$.

(C) $\cot^{-1}\frac{2x}{1-x^2}$. (D) $\tan^{-1}x$.

86. The complementary function of $y'' - 4y = 0$ is -

(A) $Ae^{2x} - Be^{-2x}$. (B) $Ae^{x} + Be^{-x}$.
(C) $A\cos x + B\sin x$. (D) $Ax^2 + Bx$.

87. If A, B, C are the angles of a triangle, then the value of the determinant $\begin{vmatrix} e^{iA} & e^{iB} \\ e^{iC} & e^{i\pi} \end{vmatrix}$ is -

(A) $-2i\sin A$. (B) $2\cos A$.
(C) $2i\cos A$. (D) $2i\sin A$.

88. If a, b, c are in arithmetic as well as geometric progressions, then a, b, c are -
(A) equal. (B) such that $a + c = b^2$.
(C) such that $ac = 2b$. (D) such that $abc = 1$.

89. The remainder when $x^3 + 2x^2 - 7x + 4$ is divided by $2x - 4$ is -

(A) 12. (B) 6.
(C) 4. (D) 3.

90. If an increase of Rs. 5 in the sale price of an item can change 3% loss in to an 8% profit, then the cost price of the item in rupees is -

(A) 100. (B) 60.
(C) 40. (D) 50.

91. If $a^6 - b^6 = (a^2 + ab + b^2)Y$, then Y is -

(A) $(a-b)(a^3 - b^3)$. (B) $(a^3 - b^3)$.
(C) $a^3 + b^3$. (D) $(a-b)(a^3 + b^3)$.

92. The value of $\frac{1}{1+\sin\theta} + \frac{1}{1-\sin\theta}$ is -

(A) $2\sin\theta$. (B) 2.
(C) $2\sec^2\theta$. (D) $2\sin^2\theta$.

100. The value of $\int_{-1}^{1} |x|\,dx$ is -

(A) 1/2. (B) $-1/2$.
(C) 1. (D) -1.

101. The angle at which the line $x+y=1$ cuts the curve $y=e^x$ at (0, 1) is -

(A) 0. (B) $\frac{\pi}{6}$.

(C) $\frac{\pi}{4}$. (D) $\frac{\pi}{2}$.

102. The curve $y=\frac{2x}{1+x^2}$ has a maximum ordinate at -

(A) $(-1, -1)$. (B) (0, 0).
(C) (1, 1). (D) (2, 4/5).

103. The value of $\lim_{x\to\infty} x\tan\left(\frac{1}{x}\right)$ is -

(A) 1. (B) ∞.
(C) 0. (D) -1.

104. The number of real tangents that can be drawn to the parabola $y^2=4ax$ through a point which lies inside the parabola is -

(A) 0. (B) 1.
(C) 2. (D) 3.

105. The focus of the parabola $y^2-4x+4y+8=0$ is -

(A) $(1, -2)$. (B) (2, 2).
(C) $(-2, -2)$. (D) $(2, -2)$.

106. The combined equation of the asymptotes and the hyperbola differs in -

(A) the coefficients of second degree terms.
(B) the coefficients of first degree terms.
(C) the constants.
(D) the coefficients of first or second degree terms.

107. Which of the following complex numbers is the identity for multiplication in the group of non-zero complex numbers?

(A) (1, 1). (B) $(1, -1)$.
(C) (0, 1). (D) (1, 0).

108. If w is a complex cube root of unity, then the value of $(2+2w+5w^2)^3$ is -

(A) -1. (B) 3.
(C) 5. (D) 27.

109. The polar coordinates of the complex number $z=1+i\cot\theta$ are -

(A) $(\text{cosec }\theta, \frac{\pi}{2}-\theta)$. (B) $(\text{cosec }\theta, \theta)$.

(C) $(\sec\theta, \frac{\pi}{2}-\theta)$. (D) $(\sec\theta, \theta)$.

110. If z moves in such a way that $\frac{z-i}{z-1}$ is purely imaginary, then the locus of z is

(A) a circle with centre at $\frac{(1-i)}{2}$.

(B) a straight line joining i and 1.

(C) a circle with centre at $\frac{(1+i)}{2}$.

(D) a straight line joining $-i$ and -1.

111. The value of i^n+i^{n+2}, when n is an integer, is -

(A) -1. (B) i.
(C) 0. (D) $-i$.

112. If α and β are the roots of $t^2-2t+2=0$ and $x+1=\cot\phi$, then $x+\alpha$ and $x+\beta$ are respectively -

(A) $\cos\phi \pm i\sin\phi$. (B) $\frac{1}{\sin\phi}(\cos\phi \pm i\sin\phi)$.

(C) $(\sin\phi \pm i\cos\phi)$. (D) $\frac{1}{\cos\phi}(\sin\phi \pm i\cos\phi)$.

113. Given $\arg\left(\frac{z}{i}\right)=-\frac{\pi}{4}$, the locus of z is -

(A) $x+y=0$. (B) $x-y=0$.
(C) $x=0$. (D) $y=0$.

114. If n is a negative integer, then $\left(\sqrt{3}+i\right)^n+\left(\sqrt{3}-i\right)^n$ is -

(A) $2^n \cos\frac{n\pi}{6}$.

(B) $2^{n+1} i \sin\frac{n\pi}{6}$.

(C) $2^{n+1} \cos\frac{n\pi}{6}$.

(D) $2^{n+1} \cos\frac{n\pi}{3}$.

115. A sufficient condition for $z_1 - z_2$ to be imaginary and $z_1 \cdot z_2$ to be real, is -

(A) $z_1 = z_2$.

(B) $\overline{z}_1 = z_2$.

(C) $z_1 = -z_2$.

(D) $\overline{z}_1 = -z_2$.

116. In a parallelogram $ABCD$, $\overrightarrow{AC}+\overrightarrow{BD}$ is equal to -

(A) $2\overrightarrow{AB}$.

(B) $2\overrightarrow{AC}$.

(C) $2\overrightarrow{BC}$.

(D) $2\overrightarrow{BD}$.

117. In a triangle PQR, A and B are mid-points of PQ and PR. Then $\overrightarrow{AB}$ is equal to -

(A) $\frac{\overrightarrow{QR}}{3}$.

(B) $\frac{\overrightarrow{QR}}{2}$.

(C) $\frac{\overrightarrow{RQ}}{3}$.

(D) $\frac{\overrightarrow{RQ}}{2}$.

118. Given $a=\vec{i}+\vec{j}-\vec{k}$, $\vec{b}=-\vec{i}+2\vec{j}+\vec{k}$ and $c=-\vec{i}+2\vec{j}-\vec{k}$, a unit vector perpendicular to both $a+b$ and $b+c$ is -

(A) $\vec{k}$.

(B) $\vec{j}$.

(C) $\vec{i}$.

(D) $\frac{\vec{i}+\vec{j}+\vec{k}}{\sqrt{3}}$.

119. If the diagonals of a parallelogram $ABCD$ are $\vec{d}_1$ and $\vec{d}_2$ and the sides are $\vec{a}$ and $\vec{b}$, then $\vec{d}_1 \times \vec{d}_2$ is -

(A) $\vec{a}\times\vec{b}$.

(B) $2(\vec{a}\times\vec{b})$.

(C) $4(\vec{a}\times\vec{b})$.

(D) not related to $\vec{a}$ and $\vec{b}$.

120. Find the value of x, so that $\vec{a}=\vec{i}+3\vec{j}+\vec{k}$, $\vec{b}=2\vec{i}-\vec{j}-\vec{k}$ and $\vec{c}=x\vec{j}+3\vec{k}$ are parallel to the same plane.

(A) -3. (B) 2.
(C) 7. (D) 5.

121. Given $\vec{a}=-\vec{j}+2\vec{k}$, $\vec{b}=-2\vec{i}+4\vec{k}$ and $\vec{c}=2\vec{i}-3\vec{j}+\vec{k}$, then $\vec{a}\times(\vec{b}\times\vec{c})$ is -

(A) $-26\vec{i}+24\vec{j}+12\vec{k}$. (B) $+26\vec{i}+24\vec{j}+12\vec{k}$.
(C) $-26\vec{i}+24\vec{j}-12\vec{k}$. (D) $-(26\vec{i}+24\vec{j}+12\vec{k})$.

122. The equation of the plane which contains the lines $\frac{x-3}{1}=\frac{y-2}{-4}=\frac{z-1}{5}$ and $\frac{x-1}{1}=\frac{y+1}{-4}=\frac{z-2}{5}$ is -

(A) $x+y+z+1=0$. (B) $x-y-z+1=0$.
(C) $x-y-z=0$. (D) $x-y+z=0$.

123. Given the equation of two planes $\vec{r}\cdot(2\vec{i}-3\vec{j}-6\vec{k})=7$ and $\vec{r}\cdot(6\vec{i}+2\vec{j}-9\vec{k})=5$, the angle between the planes is -

(A) $\cos^{-1}\left(\frac{60}{77}\right)$. (B) $\cos^{-1}\left(\frac{72}{77}\right)$.

(C) $\cos^{-1}\left(\frac{6}{7}\right)$. (D) $\sin^{-1}\left(\frac{72}{77}\right)$.

124. The function $x\log x$ $(x>0)$ attains a minimum at -

(A) $x=e$. (B) $x=-e$.

(C) $x=\frac{1}{e}$. (D) $x=-\frac{1}{e}$.

125. The area bounded by the curve $y=x^3$, the x-axis and the ordinates $x=-2$ and $x=1$ is -

(A) $\frac{17}{4}$. (B) 4.

(C) $\frac{15}{4}$. (D) 9.

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